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Signature Yue P. Li
(typed or printed)

Ins 417
A1 > A semiconductor device and an electronic device

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to a semiconductor nonvolatile memory, particularly, a semiconductor nonvolatile memory in which writing and erasing can be electrically carried out (an electrically erasable and programmable read only memory referred to as EEPROM, hereinafter). The invention is also relates to a semiconductor device.

DESCRIPTION OF THE RELATED ART

10 An electrically erasable and programmable nonvolatile memory (EEPROM) is known as a memory representing semiconductor nonvolatile memories. An EEPROM is a nonvolatile memory and different from a DRAM (dynamic random access memory) and an SRAM (static RAM), which represent other semiconductor memories. Therefore, data in the EEPROM would not be lost even when a power
15 source turns off. Further, the EEPROM has a characteristic superior in integration density, ballistic resistance, consumption power, and writing/reading speed, compared with a magnetic disc representing the nonvolatile memories other than the above EEPROM. Due to such characteristic, a trend using an EEPROM as a substitute for various memories such as a magnetic disc and a DRAM has been increased, and
20 further development in future is expected.

Information (storing information) in an EEPROM can be written and erased by charge injection to or drawing from a floating gate of each memory transistor. The storing information is discriminated by means of a threshold voltage corresponding to the amount of electric charges accumulated in the floating gate. Thus, it is important
25 to control the threshold voltage after writing or erasing in order to accurately read out storing information of an EEPROM. To inject an electron to the floating gate of a memory transistor so as to increase the threshold voltage is referred to as writing in this specification. On the other hand, to draw an electron from the floating gate of a memory transistor so as to reduce the threshold voltage is referred to as erasing.

30 In each memory transistor constituting an EEPROM, a threshold voltage thereof is respectively different after writing or erasing even when writing or erasing is carried out at a same applied voltage for a same time period. This is because the

9. Relate Back -- 35 U.S.C. 120

☒ Please amend the specification by inserting before the first line the sentence:

--This application is a continuation of copending U.S. application Serial No.

10/156,512, filed on May 28, 2002

US PAT 6,421,190

10. Inventorship

With respect to the prior copending U.S. application from which this application claims benefit under 35 USC 120 the inventor(s) in this application is (are):

☒ the same

☐ less than those named in the prior application and it is requested that the following inventor(s) identified above for the prior application be deleted:

11. Assignment

☒ The prior application is assigned of record to Semiconductor Energy Laboratory Co., Ltd.

☐ An assignment of the invention to _____ is attached (with cover sheet) for recording..

12. Maintenance of Copendency of Prior Application

☐ A petition, fee and response has been filed to extend the term in the pending prior application until _____ or

☐ A conditional petition for extension of time is being filed in the pending parent application (copy enclosed).